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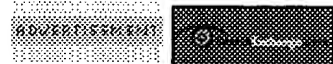
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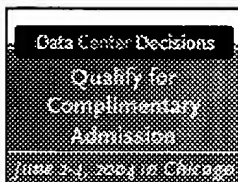
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1) Peer-to-peer is a communications model in which each party has the same capabilities and either party can initiate a communication session. Other models with which it might be contrasted include the client/server model and the master/slave model. In some cases, peer-to-peer communications is implemented by giving each communication node both server and client capabilities. In recent

usage, peer-to-peer has come to describe applications in which users can use the Internet to exchange files with each other directly or through a mediating server.

IBM's Advanced Peer-to-Peer Networking (APPN) is an example of a product that supports the peer-to-peer communication model.

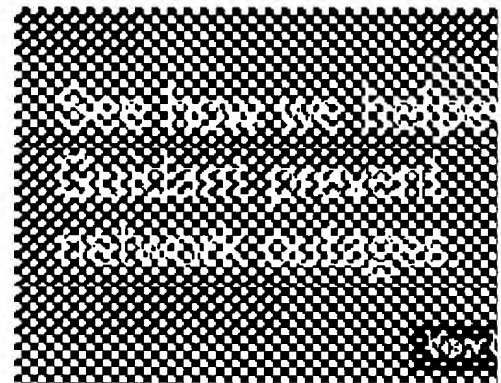
2) On the Internet, peer-to-peer (referred to as P2P) is a type of transient Internet network that allows a group of computer users with the same networking program to connect with each other and directly access files from one another's hard drives. Napster and Gnutella are examples of this kind of peer-to-peer software. Major producers of content, including record companies, have shown their concern about what they consider illegal sharing of copyrighted content by suing some P2P users.

Meanwhile, corporations are looking at the advantages of using P2P as a way for employees to share files without the expense involved in maintaining a centralized server and as a way for businesses to exchange information with each other directly.

How Does Internet P2P Work?

The user must first download and execute a peer-to-peer networking

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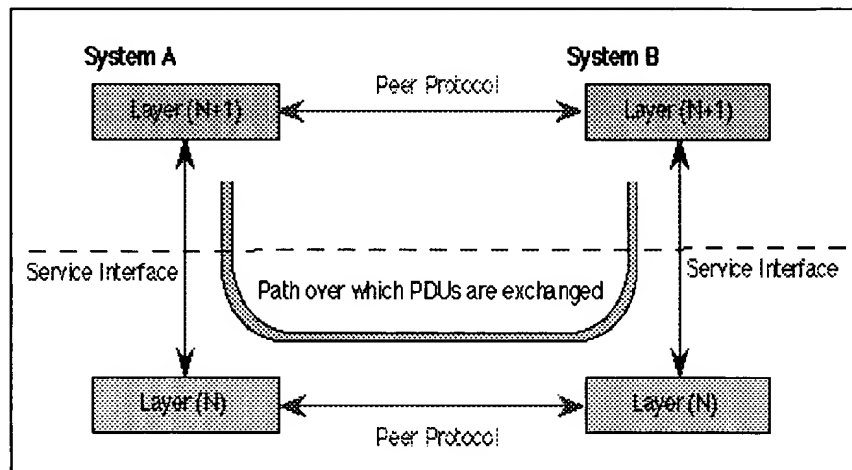
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Peer-to-Peer Communication

Engineering course

Protocol layers may be defined in such a way that the communications within a layer is independent of the operation of the layer being used. This is known as "peer-to-peer" communication and is an important goal of the OSI Reference Model.

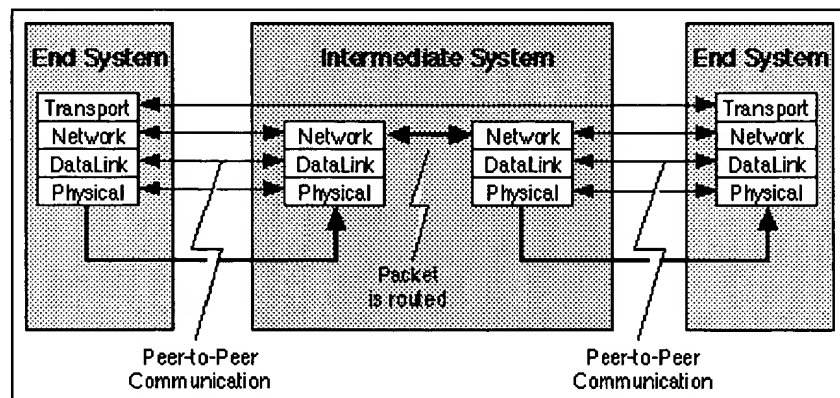
Each layer provides a protocol to communicate with its peer. When a packet is transmitted by a layer, a header consisting of Protocol Control Information (PCI) is added to the data to be sent. In OSI terminology, the packet data (also known as the Payload) is called a Protocol Data Unit (PDU). The packet so-formed, called a Service Data Unit (SDU) is passed via a service access point to the layer below. This is sent using the service of the next lower protocol layer.



Peer to peer communication using the services of a lower layer

The figure below provides an example of the OSI reference model supporting peer-to-peer communication between two End Systems (ES). In this case, the transport protocol entities communicates end-to-end using the services of the network layer below. The peer-to-peer communication takes place between the end systems using a communications protocol.

In the case of the link layer, the communication takes place using the service of the physical layer. The communication takes place with the peer data link layer protocol in the next directly connected system (either an Intermediate System or an End System).



Peer-to-Peer communication between OSI protocol layers

A more detailed example of the interaction between OSI layers is provided in an example.

Gorry Fairhurst - email: G.Fairhurst@eng.abdn.ac.uk - Date: 01/01/2004 EG3557

4.4 Class-Opt-3 (Peer-to-Peer Communication)

4.4.1 Function

The peer-to-peer communication is based on TCP. Before communication, one peer-to-peer communication path (TCP connection) must be established. When AP requests for transmission, a message is sent to the specified target node. Before the TCP connection can be used, an IP address and connection port number must be configured appropriately for each target node.

This communication method is useful when data must be sent securely to the target node on the one-to-one basis or bulk data transmission is required over a peer-to-peer communication path.

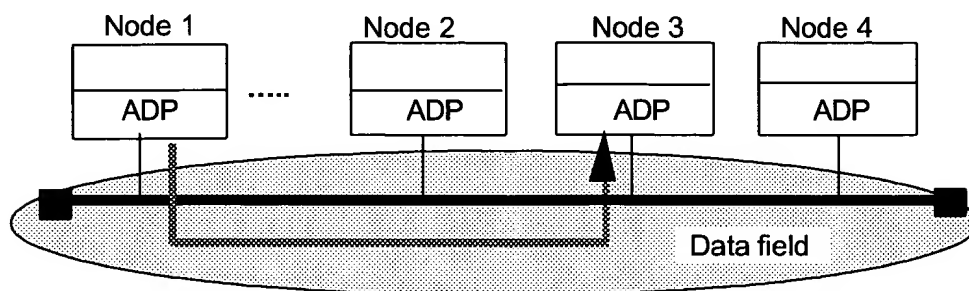


Figure 21 Peer-to-Peer communication

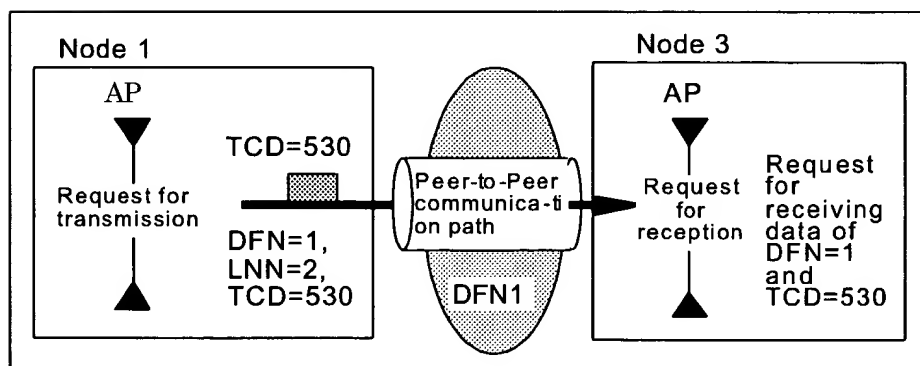


Figure 22 Peer-to-Peer communication path and transmission/reception

Peer-to-Peer communication positions upper of TCP. TCP between nodes transfers a transmitted peer-to-peer communication message through a TCP connection.

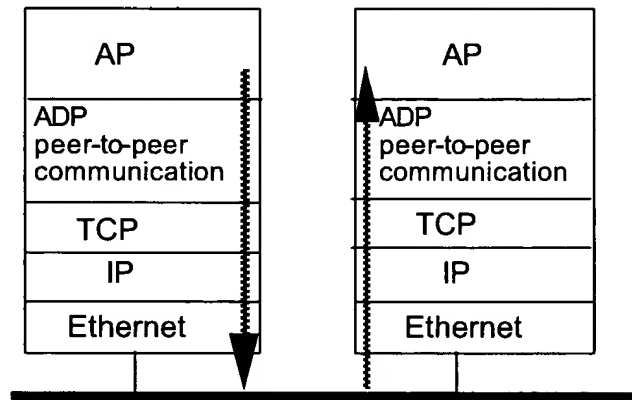


Figure 23 TCP-based communication

4.4.2 Managing TCP Connection for Peer-to-Peer Communication

4.4.2.1 Connection and Assigning TCP Port Number

For a peer-to-peer communication, a TCP port unique within a node must be assigned. When a peer-to-peer connection is established, a TCP port number defined between the two nodes is used.

Example:

Assuming that node 1 wants to connect to nodes 2 and 3 respectively. For each of the connections, an IP address to the target node number and a target TCP port number are necessary.

As the connection information between nodes 1 and 2, IP addresses IP1 and IP2 and TCP port numbers 10000 and 20000 are used. For nodes 1 and 2 connections, the four pieces of information must be defined respectively.

Before a connection can be established, the requester and receiver of the connection request must be specified. The requester may fail in establishing a connection due to any cause such as an inactive target node, however the requester should be able to retry requesting periodically. As a connection established, peer-to-peer communication becomes available.